A WELL-ATTENDED meeting was held last week to consider the desirability of presenting a testimonial to Mr. Ernest Hart in recognition of his eminent public and professional services. It was unanimously resolved that an appeal for subscriptions should be made to the medical profession and the general public in support of this movement. It was agreed that the testimonial should take the form of a portrait of Mr. Ernest Hart, to be presented to Mrs. Ernest Hart. It was announced that already over 100 influential members of the medical profession had expressed their desire to contribute to the fund. Mr. Spencer Wells was appointed treasurer, Mr. Arthur Myers, surgeon to the Coldstream Guards, and Mr. Noble Smith (24, Queen Anne Street, W.), were appointed hon. secs., and an executive committee, with power to add to their number, was appointed.

IN a recent communication to the Vienna Academy, Dr. Paulsen has described a singular series of experiments with reference to the course of air in the nasal cavity in breathing. Conclusions as to this path have been drawn from structure, but Dr. Paulsen adopted the method of lining the nasal cavity in the head of a dead body with small pieces of red litmus paper, and then causing ammoniacal air to be inhaled and exhaled through the windpipe. The changes of colour in the paper proved that the expiratory and inspiratory currents take nearly the same course, and that the main portion passes, not through one of the nasal passages, but along the septum in an arching course, convex above. The course of air-currents was investigated under varying conditions of ventilation, &c., also the behaviour of secondary cavities. Some old and new experiments on the act of smelling are explained on the basis of the facts elicited.

FROM the woody tissue of some plants (according to recent researches by Herr Max Singer, Vienna) four substances can be extracted by means of hot water: 1. Vanillin, which seems to be one of the most widely distributed plant-substances; it is found even in decayed wood and in brown coal. 2. A substance which shows the reactions of coniferin. 3. A species of gum soluble in water. 4. A substance soluble in water, and coloured yellow with muriatic acid, not identical with any of those already specified. Moreover, woody tissues (also elder pith) contain the wood gum discovered by Thomson. In what relation these substances stand to the hypothetical lignine is not determined, but the way in which they can be separated from the wood, one after another, by water, renders it probable that what is called lignine is a mixture of several chemical entities.

THE Academy of Sciences has nominated M. Bertrand as its representative at the inauguration of the Fermat statue, which will take place on August 20 next, in a small country town of Tarn-et-Garonne, where this illustrious mathematician was born, at the beginning of the 17th century.

THE additions to the Zoological Society's Gardens during the past week include a Diana Monkey (*Cercopithecus diana*) from West Africa, presented by Messrs. L. and J. Boljhon; a Bonnet Monkey (*Macacus radiatus*) from India, presented by Mrs. Norris; two Tovi Parrakeets (*Brotogerys tovi*) from Columbia, presented by Major Langford Brooke; two Uvean Parrakeets (*Nymphicus uvæensis*) from Uvea, Loyalty Isles, a New Zealand Parrakeet (*Cyanorhamphus novæ-zealandiæ*) from New Zealand, presented by Mr. E. L. Layard, H.B.M. Consul, New Caledonia; an American Robin (*Turdus migratorius*) from North America, presented by Col. Verner; a Yellow Wagtail (*Motacilla flava*), a Marsh Tit (*Parus palustris*), British, presented by Mr. H. Grant; four Speckled Terrapins (*Clemmys guttata*) from North America, presented by Mr. C. D. Ekman; a Common Snake (*Tropidonotus natrix*), British, presented by Mr. Poyer Poyer; nine Fire-bellied Toads (*Bombinator igneus*), a Lacertine Snake (*Cœlopeltis lacertina*), a Back-marked Snake (*Rhinechis scalaris*), European, presented by Mr. G. A. Boulenger; a —— Newt (*Notopthalmus viridescens*), from America, presented by Messrs. Sargent; an Undulated Grass Parrakeet (*Melopsittacus undulatus*) from Australia, deposited; a Canada Goose (*Bernicla canadensis*), British, a Sharp-nosed Crocodile (*Crocodilus acutus*) from Central America, purchased; two Geoffroy's Doves (*Peristera geoffroii*), bred in the Gardens. The following insects have emerged during the past week:—Silk Moths: *Actias selene;* Moths: *Hypochera io, Ceratocampa imperialis, Deilephila vespertilis, Deilephila euphorbiæ, Sciapteron tabaniformis, Sesia museæiformis, Sesia empiformis, Zygæna filipendulæ, Plusia concha;* Butterflies: *Apatura iris, Vanessa polychlorus, Lycænia iolas, Aporis crabægi.*

DISTRIBUTION OF AWARDS, NORMAL SCHOOL OF SCIENCE AND ROYAL SCHOOL OF MINES

THIS took place in the Lecture Theatre of the South Kensington Museum on Saturday, June 24. The Vice-President of the Committee of Council on Education, the Right Hon. A. J. Mundella, M.P., took the chair.

Col. Donnelly, after some introductory remarks, said:—In the report of the school, which you have before you, Sir, there is a paragraph from which some people might possibly imagine that the necessity for training teachers in science was not thought of when the general scheme of aid to science instruction was considered and promulgated in 1859, and that it was not until that scheme had been in operation for a few years that the necessity for training science teachers came to light. Now, Sir, I was present at the deliberations which took place on the framing of that Minute of 1859, and although it is a long time ago I have a very distinct recollection of all that occurred.

But I would here wish for one moment to digress, and recall the memory of a remarkable man who was deeply connected with those deliberations, and to whom they owe so much. He has but recently been taken from us, and though Sir Henry Cole had for several years ceased his connection with this institution, I am sure it needs no excuse from me that on this, the first public ceremony which has taken place since his death, I recall to you for one moment his memory. We cannot but all remember how much this place, and science and art instruction, I mean of course elementary science and art instruction, owe to Sir Henry Cole. No one would be so foolish as to suppose that even if Sir Henry Cole had not lived and worked we should not at the present time have had a system of elementary science and art instruction in the country; but it is given to a few men here and there, now and then, to have a clear view before them, and to have that energy and indomitable perseverance, which enables them, as it were, to put on the hands of the clock, and to impress a form and reality on what in the hands of other men would probably have remained vain imaginings. Sir Henry Cole was such a man; and no one who, like myself, worked for some fifteen or sixteen years under him, could fail to be impressed with that remarkable personality; with his boundless sympathy in all progress and work; and with his extraordinary *vis viva* which communicated some at least of his zeal and devotion to all who came in contact, and were working, with him.

Well, Sir, to recur to the deliberations with regard to the Minute of 1859; numbers of educational doctors were consulted; they all proposed, and I believe it was about the only suggestion in which they all agreed, that the first thing to be done was to establish a system of training teachers at some central institution, such as the School of Mines in Jermyn Street, which when it was first established had that object in contemplation. Fortunately—most fortunately—that advice was not followed. You will remember, Sir, that a noble lord, your predecessor in the office you now hold, has been somewhat twitted with prophesying something with regard to the steam-ploughs in Asia Minor. The day will no doubt come when his lordship will have the laugh of the scoffers. But a cargo of steam-ploughs in Asia Minor at the present moment would be a no more hopeful consignment than a number of trained teachers issued from a central establishment, to make their living by science instruction, would have been in 1859. We had to trust to a much ruder implement, if I may say so, and we had to trust to that local implement being brought out and set in motion by a system of payments by results, and right well many of those local teachers have done their work. I should remind you, Sir, that the

system of paying on results, which has had so large a development since in various directions, was first tried here. This is not, however, the occasion for discussing the general system of science instruction, and science payments, and I only advert to it at the present moment to call attention to what has grown out of it to supplement it, and that is the arrangement for bringing science teachers from the country up to London for short courses of instruction in the summer. That is a system which I believe obtains in no other place or country; I believe it is most invaluable. This point also illustrates another fact, and that is that the Normal School of Science is not the outcome of some cut and dry report of a commission, founded possibly on a foreign example, but it is the natural outgrowth of what has been found to be required. It has grown so as to suit its environment, and so far is a thoroughly English institution; and now that it has in the fulness of time—I will not say that the time may not have been a little too full—now that it has come out in its full plumage, I think the country may be congratulated on this. It has a scientific educational institution fairly provided with apparatus and appliances; but it has what is far more valuable. It has a staff of professors whose position in the scientific world for the work they have done, whose power of teaching and imparting knowledge, and whose zeal in the cause will, I believe, bear comparison with the staff of any other similar institution, or seat of learning in this or any other country at the present time.

The Chairman:—I have now the pleasure of calling on Prof. Huxley, the Dean of our re-organised institution.

Prof. Huxley:—Mr. Mundella, under ordinary circumstances the address the Dean of the School is called upon to make on occasions of this kind is confined to a statement of the condition of the school, and to an account of the manner in which the various departments of instruction are thriving or otherwise. But as this institution, the Normal School of Science and Royal School of Mines, is extremely young—in fact has not yet completed the first year of its existence—I think, with your permission, it may be well that I should call the attention of those who have honoured us by their presence to facts with which your official mind is perfectly familiar, but of which they cannot be expected to have cognisance.

As Col. Donnelly has just remarked, this institution has not been so much made as it has grown; it is therefore a particularly English institution, inasmuch as in that respect it resembles the British constitution, which, from an abstract and logical point of view is probably not the most symmetrical and reasonable fabric that ever was raised, but which has the great merit of having grown out of the actual conditions of life, and of possessing the power of adapting itself to the incessant changes of our social state. The school is not, as might be judged from its title, a dual institution like the Austro-Hungarian monarchy; but it has grown out of the growth, development, and eventual coalescence of two perfectly distinct and independent organisations, which have at different times, and quite independently of one another been set on foot by the Government of this country for the purpose of giving science—by which I mean physical science—that influence upon the industries and arts of the country which, as every one now recognises, is absolutely essential to their sound and rapid progress. The Royal School of Mines was practically established, or rather the foundations of it were laid, so far back as the year 1851, at which time a very staunch and kind friend of mine, at a time when friends were not quite so plentiful as they are now, the late Sir Henry De la Beche, one of the most sagacious and able men it was ever my good fortune to meet with, having set agoing, chiefly by his own energy, the Geological Survey of Great Britain, obtained the attachment to that service, und to the Museum of Practical Geology, which was connected with it, of an institution which I think may be described as the first technical school which was ever established in this country by the influence of Government; I do not know if private enterprise had done anything of the kind before. This institution was termed "the Government School of Mines, and of Science applied to the Arts"; and you will observe, and I call your attention to the fact, that in that title there is a duality of precisely the same nature as that which exists in our present name. No doubt one of the objects most dear to Sir Henry de la Beche and his associates, was the establishment of a technical school for those branches of science of which the applications are more or less direct to mining and metallurgy; and no doubt a considerable proportion of the influence which was brought to bear in establishing the school arose from the fact that the mining and metallurgical industries of the country were largely interested in it. But you will also observe that the school took upon itself the teaching of "science applied to the arts," and we had therein a germ, for it was no more than a germ, of what may be termed a general technical school.

Now it was about the same time that the Great Exhibition of 1851 directed the attention of people in this country, far more strongly than it had been directed before, to the extreme importance of giving our industries some better foundation than the mere rule of thumb, which up to that time had too largely obtained. That movement grew and became more important until it resulted in the creation of the Science and Art Department, the effects of which upon the art side, are unmistakeable, for you have them in this vast museum in which you now meet, which I believe is without its parallel in the civilised world. That side of the activity of the Science and Art Department grew rapidly; but the other side of it, the development of the technical application of science, was indeed attempted, but got very little further than the attempt. That attempt was made in this wise: the course of instruction in the Government School of Mines and Science applied to the Arts, then lodged in Jermyn Street, was enlarged so as to include an addition to its mining and metallurgical division, which was called a general division—a general training in physical science—and a technical division, that is to say, what we now understand as a technical school. Moreover, the Royal College of Chemistry was combined with the School of Mines; and in order, as it were, to emphasise the development of the general technical school side of the institution, its title was altered into that of the "Metropolitan School of Science applied to Mining and the Arts." That was in the year 1853, very nearly thirty years ago—a generation of men; and I have no hesitation in saying that if the idea which at that time obtained in the minds of the heads of the Department of Science and Art had been developed and carried out, it would not have been left for this generation to make the efforts which it now seems prepared to make in various ways for the establishment of a thorough and effectual system of technical education throughout the country. Whether it was that the time was not ripe for such an effort, or from what other cause, it is not worth while to inquire; but this course of development was more or less nipped in the bud. The instruction in Jermyn Street narrowed instead of widening; the general and technical divisions were gradually abolished, and the institution restricted itself as far as it could, to being a school of mining and metallurgy, pure and simple; with this difference, however, that the very large and efficient organisation for teaching chemistry under Prof. Hofmann, which existed at that time, retained a certain amount of *quasi* autonomy, and did specially profess to teach the applications of chemistry to industry. The change of policy was signalised in the year 1859 by another change of name; the institution was then called the "Government School of Mines," and so it remained for a few years, until in 1863 the title was altered once more, by way of giving the institution extra dignity, to the "Royal School of Mines," which title it has retained ever since.

I had the honour to be appointed one of the professors of the School of Mines in the year 1854. I have now, therefore, completed twenty-eight years' connection with it. I estimate that connection as one of the happiest and most honourable events of my life, having always been associated with colleagues with whom any man might have been proud to act. Moreover, let me say, in respect of such change of policy as has taken place, I am just as much responsible as anybody else, so that you must not think that I have the smallest intention of saying a word which could militate against the estimation which the School of Mines, I am happy to say, always has held, and which I profoundly trust it always will hold, if I point out to you that there were, from the very beginning, certain extremely grave defects in its constitution. I cannot say that they arose from the fault of any body concerned, but from the fact that the necessities of scientific training were understood a quarter of a century ago in a totally different way to that in which they are now understood. The only provision which was made for that practical instruction, which is the heart and soul of all efficient scientific education, in the original School of Mines, consisted in the laboratories for chemistry and for metallurgy. For no other branch of science was there any efficient practical teaching provided, and even the accommodation for chemistry and metallurgy was so imperfect, that within a very few years after the foundation of the school, laboratories for these purposes had to be sought elsewhere. For eighteen years I did my duty as well as I could towards that

institution, lecturing about natural history, and I am sorry to say, all the time, with the more or less definite consciousness, that I was an involuntary impostor, and that it was not possible for me to teach in any genuine fashion, because I had no room in which practical instruction could be given. I do not know whether my colleagues would be inclined to make the same confession, but the same want must have been felt in the teaching of physics, and in the other kinds of instruction given in the school. Moreover, we had no mathematical instruction, and, in spite of our repeated representations, it was not provided.

Now that state of things obtained up to the year 1872. By that time some of us had got extremely tired of it, and I was one of those who were so tired, my chemical colleague was another, my colleague the Professor of Physics was a third, and we got up a sort of little pronunciamento to say that we really could not go on teaching in that way any longer; that at South Kensington there was a large building which was standing perfectly empty, and might we be allowed to do our business in a more efficient way by being transferred to this empty building? With the assent and consent of our colleagues, and with the sanction of the Department of Science and Art, the desired transference took place, and the result of that was, that all the professors who were moved were able at once to institute a more or less adequate system of practical instruction, and to make the teaching in the school in their own departments something like what it ought to be. Subsequently the Professors of Geology and Metallurgy and Applied Mechanics were similarly moved, until now only the Professor of Mining remains in Jermyn Street, simply because he has there the admirable collection of models which are so important for his work.

That, Sir, is the history so far as it can be told, in a few words, of the origin and growth of the Royal School of Mines. The only change that has taken place in consequence of the new organisation in that institution is that it has been made more efficient. Mathematical instruction has been added; practical teaching has been supplied in all branches of science which the Associates of the Royal School of Mines are required to study, and I cannot doubt, seeing the respect which has for many years been paid to the title of Associate of the Royal School of Mines, that that respect will simply grow and increase with the knowledge of the public, that the only alteration which has taken place here of late years is to make the title represent a very much larger value than hitherto it has been possible it should represent.

Now, sir, I turn to the Normal School of Mines, about which my task will be easier, because Col. Donnelly has said something about it. I have spoken of my respect and affection for the older institution, the Royal School of Mines, with which I have been so long connected, but I am not quite sure that, looking at the matter from a broad and general point of view with reference to the influence of our school upon the country, that I may not have taken an even greater interest in the series of steps which have led to the organisation of the Normal School of Science. It is very hard for those whom I address, and who have not the advantage or disadvantage of being as old as I am, to believe that there was a time, hardly more than a score of years ago, when it was almost impossible for any one who was not connected either with the universities, with the medical schools, with the School of Mines, or with one or two institutions in London, to obtain the slightest tincture of practical scientific instruction in this country. When, therefore, those conferences and deliberations, to which Col. Donnelly referred just now, came to my knowledge in the year 1859, I felt profoundly interested, and I thought the plan proposed extremely well devised, and that it was the only one, whatever its imperfections may be, which at that time was adapted to meet the wants of the time. I confess that when I heard of the establishment of these science classes, I made the same sort of reflection as the man who said let him make the songs, and he did not mind who made the laws. I said to myself, I do not care in the slightest degree from this time forth what the universities, or what the public schools may do in the way of teaching science to the non-professional classes; they are bound now *se soumettre ou se demettre;* either they will follow in the wake of this movement towards general scientific education of the country, or they will pass out of the stream of progress of modern culture. You may think that was a very large anticipation to base upon a small foundation, and undoubtedly it was; but the immense development of this system of scientific teaching has, I think, entirely verified my anticipation, and I am happy to say that the public schools and the Universities have followed suit, until now it is as easy to obtain a fair general scientific training in this country, as a quarter of a century ago it was difficult.

Well then, this system of science classes having spread over the country, it soon became apparent that the greatest obstacle to its efficiency lay in the want of knowledge of proper modes of teaching on the part of teachers. It is lamentable how much the ordinary mode of education in what is often called literature, but commonly is not, tends not only not to help a man to become a learner or a teacher of physical science, but rather to impede his becoming one. Nothing is more surprising to me than to find a number of instructed persons coming up here for scientific education, and to discover that they cannot observe. They have been so accustomed to take statements on credit from books and word of mouth that they have almost lost the faculty of seeing things for themselves. I remember after having given a lecture, accompanied in my ordinary way by drawings on the blackboard, that I went to look through the microscope, and see what one of the students who had heard this lecture was drawing. To my astonishment, I saw that his drawing was the thing I had drawn on the blackboard, not the thing under the microscope. I said to him, What is this? this is not at all like what is under the microscope. No, he said, that is what was on the blackboard. He did not believe nature, he believed me; and the great lesson I have tried to teach, which is the fundamental basis of scientific teaching is, do not put too much faith in your teacher, but do believe nature. The only way of remedying this evil habit of taking science on trust, is to give the science teachers the opportunity of obtaining a discipline in the methods and a practical acquaintance with the most important facts of the particular branches of science which they profess to teach. That has been done partly by bringing up teachers from the country for short courses such as are now going on, or will shortly be going on in this institution, and partly by giving them the opportunity individually of attending the courses of the Royal School of Mines during its separate existence. What happened last year was that this system of bringing up teachers for scientific training, for training, that is to say, in special branches of science, was made systematic and thorough. By adding to the staff of the Royal School of Mines a chair of Mathematics and Mechanics, a lectureship on Astronomy, a lectureship on Agriculture, in addition to lectureships on some other subjects, and by providing full means of practical instruction, the institution is now able to provide for a tolerably efficient training, extending over a considerable number of months, of teachers of the science classes in those matters of elementary science which it is needful for them to understand thoroughly in order to teach properly.

Having been practically interested in the administration of the great measure of education for the masses of the people, which was set on foot a dozen years ago, it is particularly gratifying to me to see this last step taken, because it appears to me that so far as science is concerned, it is the crowning of all the organisations which a Government may and should undertake in regard to the education of the masses of the population. The result is this: At this present time, if there be anybody in the remotest district of England in which these science classes are established, if there be any child who has a faculty for science, which is a thing inborn, and as much a genius as the faculty for art; that child, boy or girl, as the case may be, has open to him or her the means of instruction in one of the science classes. To those who have not any special faculty, science certainly will not do any more harm than learning anything else that they learn without understanding, as most boys do learn so many things at all schools. But if the scholar possesses this scientific faculty which I just now spoke of, it is open to him to distinguish himself at the May examinations. If he distinguishes himself at the May examinations, scholarships are open to him at various institutions, among the rest in this Normal School. If under the instruction which is offered to him, he shows a higher kind of scientific capacity, I do not know that there is any limit to the point which he may eventually reach. If he has in him the making of a Davy or a Faraday—and once in thirty or forty years men of that kind are born in the most out of the way and unlikely places—if he have that faculty, there is no longer a need that he should hopelessly struggle with adverse obstacles, but the path to reach that position in which he may serve his country most effectually is laid open to him by the organisation which I have described. And in order to make

that organisation complete, we are endeavouring to give such instruction to the teachers as will enable them to aid in this business of picking out from the mass of youth under instruction those who are most likely to attain scientific distinction, and to train and inform those who are likely to profit by scientific instruction.

I am sorry, Sir, that I have detained you so long. It now only remains for me to report to you that, at present, the number of students in the Institution amounts to 198. I may say, that in only one or two classes is there a slight falling off in numbers. In several the numbers are enlarged, particularly in the metallurgical class, and in the geological class, in which latter the demand for a system of instruction which has been established here by my colleague, Prof. Judd, has been so considerable, that several have had to be turned away for want of accommodation. You will be glad to know that this system is so thorough and so efficient, that from abroad men are sent to study its working. The whole school is at present in a very healthy condition. Some little difficulties attended its birth, as is very often the case with strong and lusty infants; but I think our infantile complaints have all now subsided, and I hope that the institution may look forward to a vigorous manhood.

General Martin was then called upon to read the names of the successful students. He said: The ceremony to-day of necessity came so closely on to the heels of the examinations, that the general lists could not possibly be made up. Only those awards, therefore, would appear to-day which could be ascertained in time. For this same reason we may hope that some other gentlemen, in addition to those who receive the Associateship to-day, will be found to be qualified, and receive it hereafter.

The following names were then read, and the certificates and prizes were delivered by the Chairman:—

List of Students who are to receive Associateships, June, 1882

A. W. Day	1st Class	Mining
F. W. Harbord	1st Class	Metallurgy
G. Kamensky	1st Class	,,
F. L. Cepero	2nd Class	Mining
G. Ross Divett	1st Class	,,
J. E. Green	2nd Class	Metallurgy
J. P. Walton	1st Class	,,
F. L. I'Anson	2nd Class	Mining
M. Staniland	1st Class	Metallurgy
	2nd Class	Mining
F. T. Barnett	1st Class	Metallurgy
J. H. White	1st Class	,,

Award of Prizes, Scholarships, &c., June, 1882

2nd Year's Scholarships	H. F. Collins, R. T. Bodey
1st Year's Scholarships	A. Sutton, H. W. Hughes, T. Mather, H. G. Graves

Medals, &c.

"Forbes"	C. J. Gahan
"Murchison"	H. F. Collins
"Tyndall"	W. T. Burgess
"De la Beche"	C. H. Powell
"Bessemer"	J. J. Hood (1880–81), F. W. Harbord
Chemistry Prize, "Hodgkinson"	C. A. White

The Chairman:—Mr. Dean, ladies and gentlemen, in the discharge of tbe duties of my office I have seldom had to perform a more interesting duty than the one I have just fulfilled, of distributing the awards to the successful students on this occasion. I am not going to dctain you at this hour with a speech, especially as you have had a most excellent address from that master of science and oratory, the Dean of our Normal School. It would not only be bad taste, but it would be a great indiscretion on my part, if surrounded by men so eminent in science, I ventured to talk to this audience on any scientific question. All I have to express is my great gratification in being in the humblest degree instrumental in bringing the Normal School to its last phase, and to its present position. I am sorry that my noble friend, the Lord President of the Council, who is at this moment discharging also the arduous duties of Lord Lieutenant of Ireland, is not here to day to preside over this interesting ceremony, for he took the greatest possible interest in the reorganisation of the school, and of bringing it into the position which fulfils so admirably the conditions of usefulness which Prof. Huxley has so well described to you.

We have all felt in the words which fell from Col. Donnelly how much science and art in this country and in this place owe to the late Sir Henry Cole, and I should not feel satisfied to address this audience without expressing my own deep conviction of the great service which he rendered to his country, services which will endure for generations and centuries, the value of which we only yet very imperfectly realise. Prof. Huxley pointed out how slow the growth of science teaching in this country had been as compared with the success of art-teaching. It is hardly to be wondered at how much more easy it is to appreciate beauty and art as applied to industry than to see at once the advantages which science confers on industry. Even the most superficial of us who have lived for the last thirty years cannot walk through the streets of London, cannot look into any ordinary shop, or look into a shop window, without being struck with the marvellous change which has come over the textile and metallic productions of this country in the way of their artistic character. There is nothing so remarkable as the change which has taken place in our curtains, or carpets, or hangings, or furniture, or decorations, in everything admitting of the application of art to our common life. There is nothing more charming or more agreeable to realise, but it is not so easy to understand the enormous value and importance of scientific instruction, as it is to appreciate at once the advantages of art training. The influence which art has had on the industry of this country through the instrumentality, I think, in the first instance, of the late Prince Consort, and the men who surrounded him thirty years ago at the exhibition of 1851—that influence is something incalculable, I believe, not only in its advantages to those of us who enjoy the pleasure of these more interesting surroundings, but also in the industry of the country, and in the extent of its employment and manufacture, and the hundreds and thousands of people who are benefited by an increase of our export trade. But we have, and I am glad to know that the manufacturers of this country are beginning to realise it, been far behind in science-teaching. We have been behind our neighbours in France and Germany, and other countries. They have within the last twenty or thirty years made prodigious efforts, and are still making prodigious efforts to apply science to individual industry, and to avail themselves of the resources of science in order to improve their manufactures and to develop the resources of their country in order that they may successfully compete with us in the markets of the world. I know nothing so astonishing as the lavish expenditure and the prodigious efforts that France and Germany have made within the last ten years to increase science teaching in those countries. However, if we have been slow in our growth, I am not at all disheartened, because I believe it has been sure, and, as Prof. Huxley has told you, it is better fitted to the circumstances and wants of our country, probably, than the Government-created institutions which have prevailed abroad. I do not want for one moment to anticipate the report of the Royal Commission on technical education which is now pursuing its investigations. I am quite sure that Commission will lay before Parliament and the country not only a most interesting, but a most startling report; but at the same time I am not at all afraid that we are so behind that we cannot adapt ourselves to the circumstances of the case, and that we shall not continue to hold our own in the industrial progress of the future as we have in the past.

Prof. Huxley told you that, twenty-five years ago, in our provincial towns, and even in London, there was hardly any opportunity for scientific instruction. I know in my own early days the only opportunity an inquiring young man had was to be found in the classes of Mechanics' Institutions, where some amateur student of science was willing to convey to his fellows some share of the little knowledge which he himself possessed. But anything like systematic scientific instruction was utterly unknown in the great centre of industries of this kingdom thirty years ago. To-day, in connection with the Science and Art Department, there are 1760 teachers, at least, principal teachers, I am excluding assistants. There are 60,000 students in schools receiving grants from the Government, in connection with the Science and Art Department. There are about 200 students that we have here in this institution, 50 of whom are in training as teachers, and there are 200 science teachers who come from the provinces ever year to receive short courses of instruction, with their travelling expenses paid, and an allowance made to them

whilst they are pursuing their studies in this institution. We have also twelve exhibitions of 50*l.*, four of 15*l.*, and two of 25*l.*, which are awarded annually by the Government. These are only the nucleus, so to speak, of numbers of exhibitions which are given in various localities, and that bring to this institution for training, the men who have the faculty for science teaching, and who will be the future teachers for science in this country. I am sure no one can have been present to-day, and have seen those young men advance to the table, and have seen them receive their certificates of associateship, and their honourable awards for their successful studies, without feeling that those men are going to carry to all the centres of industry an amount of light and knowledge which will be of immense advantage, not only to themselves, but to the industry with which they are associated. In every part of England there is a demand for technical instruction, and that demand is very much groping in the dark, for our people hardly understand what they mean by it yet. It means they want to know the *rationale* of the work which they are doing. They are tired of working by rule of thumb, that when, as I have heard a Dyer explain how he got certain results, he tried his alkalies and acids by dipping his thumb into them and tasting them, and when he found the components for some particular dye, he took a shovelful of this and a shovelful of the other, and so arrived at certain results which he could rarely arrive at with precision again, but which was mere guesswork, rule of thumb, chance, and accident; all that is passing away, and I believe, as the result of the good work that is doing in this institution. I am sure you will all join with me in expressing the hope that our Dean, who holds that title for the first time during the last year, will long remain at the head of this institution, to carry it to that success to which he aspires, and which he has done his utmost, by his noble effort and by his constant and eloquent advocacy, to secure.

DUNSINK OBSERVATORY[1]

MR. DREYER, having been appointed to succeed the late Dr. T. Romney Robinson as director of the Armagh Observatory, will vacate his post here next September. An advertisement has been inserted in NATURE inviting applications for the post of assistant. I have received a number of replies, but I am not yet in a position to make a definite recommendation. I do not like to allow Mr. Dreyer's resignation to pass without expressing the high opinion I have of the manner in which his duties here were discharged.

The meridian circle has been as before in the entire charge of Mr. Dreyer. During the past year Part IV. of the Dunsink Observations and Researches has been issued, in which is contained an account of the meridian circle and a catalogue of the red stars whose places have been determined. In July and August many nights were spent observing the two bright comets, but the weather was so unsettled that only four observations of Comet III. and two of Comet IV. could be secured on the meridian.

In September a series of observations of stars between $-2°$ and $-23°$ declination were commenced. In all there have been made 713 observations of transits, and 582 observations of declination; the reductions to apparent place are completed for R.A. up to December 11, and for decl. up to March 10.

The meantime clock service has been continued throughout the year. The circuit has been tested on 349 days—from July 1 up to June 14—with the following results :—

265	days'	error not greater than 1 sec.
56	,,	between 1 sec. and 2 secs.
28	,,	greater than 2 secs.

I referred in my last report to the chronograph which Mr. Grubb has had in hand. From a great press of other work, the instrument has not yet been quite finished, but I think we may now regard the chief difficulties as conquered, and I look forward very shortly to having a chronograph which will enable us to do real justice to the meridian circle.

The South Equatorial has, as before, been chiefly employed by myself in the observations of stars for annual parallax. The number of the observations made altogether amount to 186. This number is less than that in former years, because several series of observations have been brought to a close during the present year, and the results have been discussed and prepared for publication. I now submit the manuscript which is ready for the press as Part V. of our publications. The work will be considerably larger than the parts formerly issued, and will contain 200 pages or somewhat more. It consists entirely of the parallax researches made by myself at the South Equatorial in the last four years, and brief abstracts have occasionally appeared elsewhere. I now only glance at the portions completed since the last visitation.

In my last report I stated that the measures of the position angle of $+50°$, 1724, from Groombridge, 1618, required further discussion: that discussion they have since received, and the result is very satisfactory. From the distances I had obtained from Gr. 1618 a parallax of

$$0''\cdot334 \pm \cdot036.$$

From the position angles the discussion now submitted gives a parallax of

$$0''\cdot314 \pm \cdot031.$$

By combining these results, we find as the result of 106 nights of observation the mean value

$$0''\cdot322 \pm \cdot0''\cdot028.$$

Considering the smallness of the probable error, it can hardly be doubted that this object has a parallax of a third of a second.

I also submit the completely discussed observations of 368 stars which have been examined in the manner already described as reconnoitring for annual parallax. In the great majority of cases the results are negative, yet even in these cases I believe the work is of value as a part of the general survey of the heavens. It is also, I believe, the only systematic effort which has yet been made to search for the nearest neighbours of the sun.

I am, however, glad to say that all the results of this work are not purely negative, but that certainly in one instance, and probably in others, results of considerable interest have arisen. At the present moment I am only in a position to speak definitely as to one object, viz. the star 6 Cygni B = Σ2486.

My attention was directed to this star from the circumstance that the reconnoitring observations indicated a probable parallax, and I determined to observe it systematically. The observations were made on 33 nights, the first being November 30, 1879, and the last being December 22, 1881, observations of the distance and of the position angle now submitted. The mean value of the parallax from the distances is—

$$+ 0''\cdot504 \pm \cdot060,$$

and from the positions

$$+ 0''\cdot383 \pm \cdot130,$$

the mean being

$$+ 0''\cdot482 \pm 0''\cdot054.$$

It is a matter of considerable interest to observe that this is about the same parallax as that of 61 Cygni, another object in the same constellation, and a double of the same character.

The proposed part v. will consist of five papers, as follows :—(1) Reconnoitring observations of 368 stars, with a view of finding whether they have a large parallax; (2) on the annual parallax of Groombridge 1618; (3) further researches on the annual parallax of 61 Cygni; (4) on the annual parallax of P. III., 242; (5) on the annual parallax of 6 Cygni B.

Brief accounts of the results of 2, 3, 4 have already appeared in the *Proceedings* of the Royal Irish Academy or in the special astronomical journals. It is now proposed that they shall be issued fully and with all the information necessary to enable astronomers to judge them adequately.

Besides this work, which I now submit as completed, there is a large mass of other work which is in a partially completed state. The red star Sch 249 (*a*) seems to have a parallax, and I have completed two sets of observations thereon. These have indeed been finished for some time, but I have not yet been able to complete the discussion, and further observations will probably be necessary. I have also completed two sets which will give four independent determinations of the parallax of μ Cephei. There are also some hundreds of the reconnoitring observations in a half-completed condition, most of which I hope to observe during the autumn.

Up to the present I have almost entirely confined my work with the South Equatorial to the researches on annual parallax with which Dunsink is historically associated. I have, however, after some hesitation, decided to co-operate in the proposal of Mr. Gill, her Majesty's Astronomer at the Cape, to determine

[1] Report on the Work of the Dunsink Observatory between July 6, 1881, and June 26, 1882, made to the Board of Trinity College, Dublin, at the Annual Visitation on June 27, 1882. By Prof. Robert S. Ball, LL.D., F.R.S., Royal Astronomer of Ireland.